

CLAIMS

- 1) A process for the production of linear alkanes containing less than 6 carbon atoms which comprises putting a mixture comprising one or more hydrocarbons containing at least 6 carbon atoms, in contact with a catalytic composition comprising:
- a) at least one element Me selected from Zn, Mo, Cu, Ga, In, W, Ta, Zr, Ti, metals of group VIII Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt,
- b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,
- with the exclusion of a catalytic composition comprising at least one lanthanide, at least one metal belonging to group VIII and a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B when the mixture treated is a mixture containing aromatic compounds.
- 2) The process according to claim 1, wherein the mixture comprises one or more hydrocarbons containing at least 6 carbon atoms, selected from aromatic compounds, open-chain alkanes or alkanes with cyclic structures, alkenes having one or more unsaturations with open chains

or alkenes with cyclic structures having one or more unsaturations.

3) The process according to claim 2, wherein the mixture comprises one or more hydrocarbons selected from  
5 open-chain alkanes or alkanes with cyclic structures, open-chain alkenes having one or more unsaturations and alkenes with cyclic structures having one or more unsaturations.

4) The process according to claim 2, wherein the mixture  
10 ture contains aromatic compounds and is put in contact with a catalytic composition comprising:

a) at least one element Me selected from Zn, Mo, Cu, Ga, In, W, Ta, Zr, Ti, metals of group VIII,

b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti  
15 or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,

with the exclusion of a catalytic composition comprising at least one lanthanide, at least one metal belonging to  
20 group VIII and a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B.

5) The process according to claim 4, wherein the mix-  
25 tures containing aromatic compounds are put in contact

with catalytic compositions essentially consisting of:

a) at least one element Me selected from Zn, Mo, Cu, Ga, In, W, Ta, Zr, Ti, metals of group VIII,

b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti  
5 or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B.

6) The process according to claim 1, wherein the catalytic composition comprises:

10 a) at least one element Me selected from Zn, Mo, Cu, Ga, In, W, Ta, Zr, Ti, metals of group VIII, Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt,

b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti  
15 or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,

c) one or more lanthanides,

with the exclusion of a catalytic composition comprising at least one lanthanide, at least one metal belonging to

20 group VIII and a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B when the mixture treated is a mixture containing aromatic compounds.

25 7) The process according to claim 6, wherein mixtures

containing aromatic compounds are put in contact with catalytic compositions containing:

- a) at least one element selected from Mo, Cu, Ga, In, W, Ta, Zr, Ti,
- 5 b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,
- c) one or more lanthanides,
- 10 with the exclusion of a catalytic composition comprising at least one lanthanide, at least one metal belonging to group VIII and a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of
- 15 the aluminum with Fe, Ga or B.
- 8) The process according to claim 7, wherein the catalytic composition essentially consists of:
  - a) at least one element Me selected from Zn, Mo, Cu, Ga, In, W, Ta, Zr, Ti,
  - 20 b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,
  - c) one or more lanthanides.
- 25 9) The process according to claim 1, wherein the zeo-

lite is Y-zeolite.

10) The process according to claim 1, wherein the zeolite is partially in acidic form.

11) The process according to claim 9, wherein the molar  
5 ratio  $\text{SiO}_2/\text{Al}_2\text{O}_3$  in the zeolite ranges from 3 to 400.

12) The process according to claim 11, wherein the molar ratio between silicon oxide and aluminum oxide preferably ranges from 5 to 50.

13) The process according to claim 1, wherein the Me is  
10 selected from Pt, Pd, Ti, Zn, Mo, Cu, Ni, Zn/Mo, Cu/Zn, Pd/Ti and Ni/Mo.

14) The process according to claim 13, wherein the catalytic compositions contain Y-zeolite and Pd, Y-zeolite and Pt, Y-zeolite and Ni, Y-zeolite and Zn, Y-zeolite and  
15 Mo, Y-zeolite and Zn together with Mo, Y-zeolite and Zn together with Cu, Y-zeolite and Pd together with Ti, Y-zeolite and Mo together with Ni.

15) The process according to claim 6, wherein the catalytic compositions contain Y-zeolite and La together with  
20 Zn and Mo, Y-zeolite and La together with Zn and Cu.

16) The process according to claim 1, wherein the element Me is present in the catalytic composition in the form of an oxide, ion, metal or a mixture of these forms.

17) The process according to claim 1, wherein Zn, Mo,  
25 Cu, Ga, In, W, Ta, Zr or Ti are in a quantity varying

from 0.1 to 50% by weight with respect to the total weight of the catalytic composition.

18) The process according to claim 17, wherein the quantity of the element Me varies from 0.5 to 30% by weight.

5 19) The process according to claim 1, wherein the metal belonging to group VIII is in a quantity ranging from 0.001 to 10% by weight.

20) The process according to claim 19, wherein the metal of group VIII is in a quantity varying from 0.1 to 5% by weight with respect to the total weight of the catalytic composition.

21) The process according to claim 6, wherein the lanthanide is lanthanum.

22) The process according to claim 6, wherein the lanthanide is in the form of an oxide, ion or a mixture of these forms.

23) The process according to claim 6, wherein the lanthanide is in a quantity, expressed as an element, varying from 0.5 to 20% by weight with respect to the total weight of the catalytic composition.

24) The process according to claim 23, wherein the lanthanide is in a quantity ranging from 1 to 15% by weight with respect to the total weight of the catalytic composition.

25 25) The process according to one or more of the previous

claims, wherein the catalytic composition of the present invention contains a binder.

26) The process according to claim 25, wherein the binder is selected from silica, alumina, clay.

5 27) The process according to claim 3, wherein the mixtures containing alkanes and/or alkenes are mineral oil fractions, or derive from the hydrogenation of mineral oil fractions, or from the hydrogenation of fractions from conversion plants.

10 28) The process according to claim 2, wherein the mixtures containing aromatic compounds are fractions coming from thermal or catalytic conversion plants, or mineral oil fractions.

29) The process according to claim 28, wherein said  
15 fractions are pyrolysis gasolines, fractions coming from pyrolysis gasolines or residual fractions coming from production plants of aromatic compounds and reforming.

30) The process according to claim 2, wherein the aromatic compounds are toluene, ethyl benzene, xylenes, benzene, C<sub>9</sub> aromatic compounds, derivatives of naphthalene  
20 and their mixtures.

31) The process according to claim 29, wherein said fractions are mixed with heavy fractions coming from fuel oil from steam cracking (FOK) or Light Cycle Oil (LCO)  
25 from fluid bed catalytic cracking.

32) The process according to claim 28, wherein the mix-  
tures are heavy fractions coming from fuel oil from steam  
cracking (FOK) or Light Cycle Oil (LCO) from fluid bed  
catalytic cracking, previously treated to remove the as-  
5 phaltenes.

33) The process according to claim 1, wherein the re-  
sulting fraction of n-alkanes prevalently consists of  
ethane, propane, n-butane and n-pentane.

34) The process according to claim 33, wherein the frac-  
10 tion of n-alkanes containing from 2 to 5 carbon atoms  
ranges from 50 to 90% by weight of the resulting product.

35) The process according to claim 1, carried out in the  
presence of hydrogen at a pressure ranging from 5 to 200  
bar, at a temperature ranging from 200°C to 700°C.

15 36) The process according to claim 35, carried out in  
the presence of hydrogen at a pressure ranging from 25 to  
100 bar, at a temperature ranging from 300°C to 600°C.

37) The process according to claim 35, carried out at a  
weight ratio  $H_2$ /charge ranging from 0.1 to 1.4.

20 38) The process according to claim 37, carried out at a  
weight ratio  $H_2$ /charge ranging from 0.1 to 0.7.

39) The process according to claim 35, wherein a paraf-  
fin is used as diluent.

40) Catalytic compositions comprising:

25 a) at least one element Me selected from Zn, Mo, Cu, Ga,



In, W, Ta, Zr, Ti, metals of group VIII, Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt,

b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti  
5 or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,

with the exclusion of a catalytic composition comprising at least one lanthanide, at least one metal belonging to group VIII and a zeolite selected from Y-zeolite and Y-  
10 zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B.

41) The catalytic compositions according to claim 40, additionally containing one or more lanthanides.

15 42) A process for preparing the catalytic composition, according to claim 40, which comprises treating the zeolite with a compound of the element Me by means of ion exchange or impregnation, drying and calcining.

43) The process according to claim 41, which comprises  
20 treating the zeolite with a lanthanide compound, treating the product thus obtained with a compound of the element Me, drying and calcining.

44) The process according to claim 43, wherein the lanthanide is inserted in the zeolite in acidic form by  
25 means of ion exchange, optionally calcining the product

thus obtained, the element Me is then deposited by ion exchange, and the product obtained is dried and calcined.

- 45) A process for the production of linear alkanes containing at least 6 carbon atoms from mixtures containing aromatic compounds having a structure with at least 6 carbon atoms using a catalytic composition consisting of:
- a) at least one element Me selected from Zn, Mo, Cu, Ga, In, W, Ta, Zr, Ti, mixed with one or more metals of group VIII,
  - 10 b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,
  - c) one or more lanthanides.
- 15 46) A catalytic composition consisting of:
- a) at least one element Me selected from Zn, Mo, Cu, Ga, In, W, Ta, Zr, Ti, mixed with one or more metals of group VIII,
  - b) a zeolite selected from Y-zeolite and Y-zeolite modified by partial or total substitution of the Si with Ti
  - 20 or Ge and/or partial or total substitution of the aluminum with Fe, Ga or B,
  - c) one or more lanthanides.